Flood-Inundation Mapping Benefits

The flood-inundation maps created during this study are an important tool for public officials and residents to minimize flood deaths and damage in the flood plain of the lower Blue River in Kansas City and supplement information collected by the metropolitan Kansas City flood-alert system. Availability on the World Wide Web of inundation maps and near real-time river-stage data permit users to view near real-time stage information and select inundation maps for current flood conditions, forecasted peak stage, or other selected crests. Forecast inundation maps permit people in flood-affected areas to know where unsafe driving conditions are or will be and to warn neighbors who do not have access to a computer or the World Wide Web. Local emergency management personnel can use forecast peak inundation maps to determine threatened areas, identify road closures, and take appropriate actions to warn property owners. The maps will help the public, business owners, and the media to give warnings of property and roads threatened by floodwater, help in rescue operations during a flood and may help to save lives. Federal, State, and local emergency management teams can more efficiently conduct damage assessments and provide public information concerning flood insurance, acquisition of property, and applications for hazard mitigation grants.

In addition to information related to location and water depth of inundated areas, the two-dimensional modeling results provide velocity magnitude and direction throughout the study reach along the Blue River between 63rd Street and Blue Parkway. Such hydraulic details will be used for proposed channel improvements and assessing flooding impacts on structures in the flood plain.

Flood-Inundation Mapping Limitations and Map Interpretation

Although there are substantial benefits to the flood inundation maps, correct map interpretation depends on understanding the limitations and the error associated with the data used to construct the maps. Data used to construct the flood inundation maps include topographic data, one- and two-dimensional hydraulic model results, measured high-water marks, and interpolated stage elevations. In addition, small tributary flooding and ponding of local runoff can cause inundation not depicted on the maps.

Flood-inundation maps show inundation for the downstream reaches of some minor tributaries of the Blue River. Flood inundation indicated for these tributaries is from flooding on the Blue River. When flooding occurs on these tributaries, as well as on the Blue River, the actual flood inundation along these tributaries could be higher than the estimated flood inundation. Inundation maps in this report also assume open channels with no blockages from log jams or other debris. Flood inundation can be greater upstream of the obstructions.

Topographic data used for these maps is accurate to plus or minus 1 ft (one-half the contour interval of 2 ft). Depth of flood inundation was calculated by subtracting land-surface elevation from stage elevation for each flood inundation map. For areas that are flat or have a low slope, a 1-ft increase or decrease in flood depth may result in a large increase or decrease in inundated area.

Hydraulic models are approximations of actual streamflow and simulated discharge and stage typically deviate from reality. Measurements of discharge typically are within plus or minus 5 percent of the actual discharge, and hydraulic model results calibrated to measured discharge are subject to the limitations of those measurements. Variations in the error range are caused by changes in the cross-sectional area of flow at different values of discharge. The two-dimensional model results were within about 0.5 ft of high water marks for the study reach. However, error also is associated with the use of high-water marks collected after a flood. These marks are indicated by the elevation of the line of sediment or mud-coated surfaces or the location of deposits of floating material that were left behind as flood water receded. They approximate the maximum elevation of the flood surface, but are not exact because of wave action, multiple peaks, or peaks from local tributaries. Errors usually are less than 0.1 ft.

During flood conditions when water flows at a high velocity, ramping may occur as water flows over submerged structures. This can raise the flood surface above what an interpolated surface indicates over small areas near submerged structures. Ramping can occur where water flows over submerged road beds, bridge decks, or other large features. In areas where flow is constricted, such as bridges or other structures with small openings, actual stage elevations may differ from interpolated stage elevations over small areas near the constriction. Upstream from these structures, the actual stage elevation will be higher than the interpolated surface; downstream the stage elevation will be lower. The amount of error is variable and depends on water velocity and the size of the constriction.

Flooding usually is associated with large amounts of local rainfall. Inundation from direct rainfall of some small areas within the Blue River flood plain may occur from small tributaries before the flood-inundation maps indicate flooding caused by the Blue River.

Errors and variations in data rarely occur in only one direction. The chance that the flood inundation data for any one point is based on the maximum possible error is small because the errors are unlikely to be all positive or all negative with respect to the actual value. A combination of errors of varying value and sign is more likely to occur. **To account for errors, the user should inspect not only the maps that represent the gage location and stage of interest, but also maps for values of stage both greater and less than the stage of interest.**